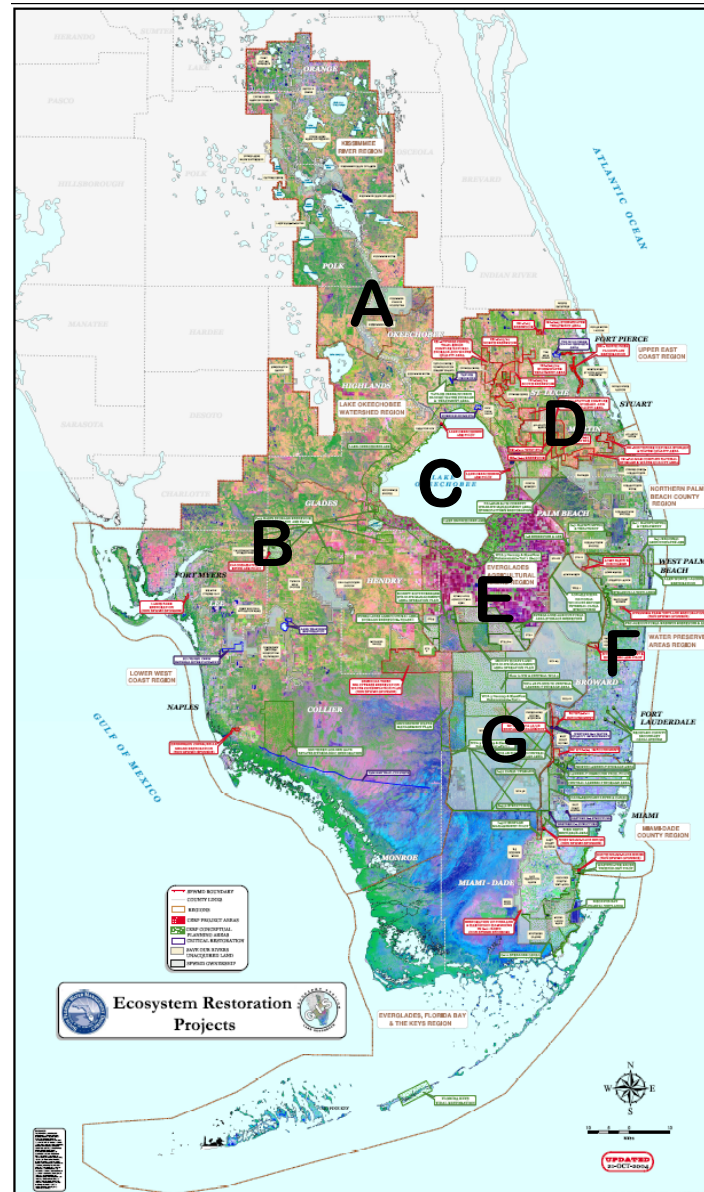# Ecosystem Modeling

Challenges in Ecosystem Modeling and Decision Making

An Overview of Experiences in Southern Florida

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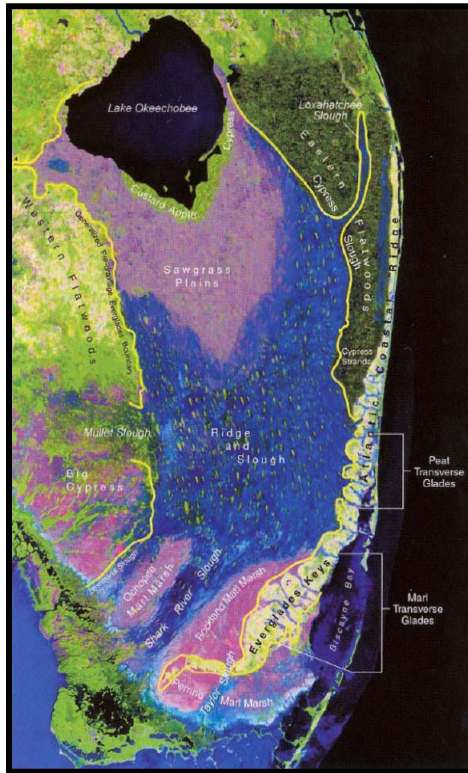3301 Gun Club Road
West Palm Beach, FL 33406

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Engineer Research and Development Center Workshop   22-June-2006

Setting – Central and Southern Florida

Ecosystem Restoration Activities

- **River restoration**
- **Lake restoration**
- **Estuary restoration**
- **Wetland enhancement**
- **Wetland restoration**
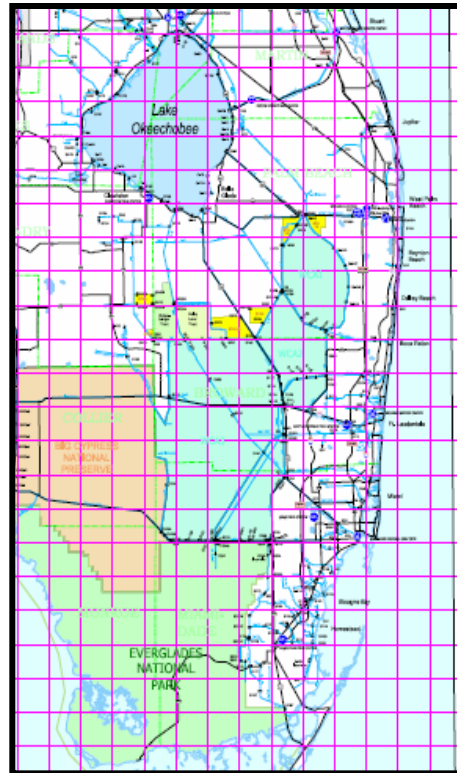- **Wetland creation**

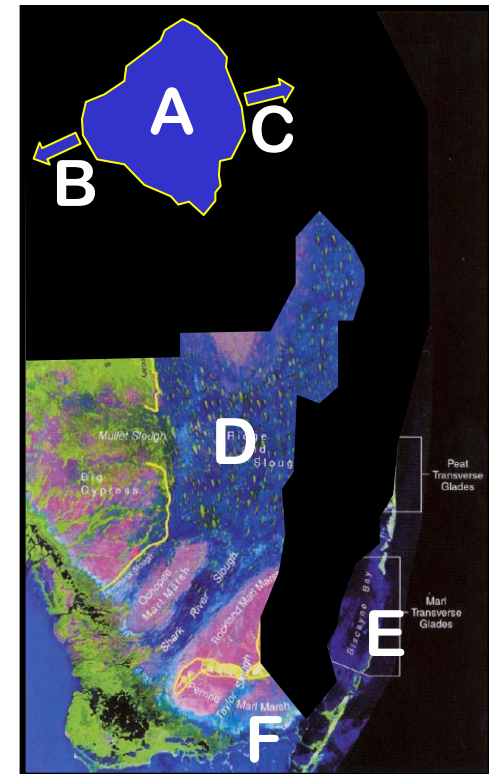## Challenges

Then and Now...

Historic Landscape

Present Landscape
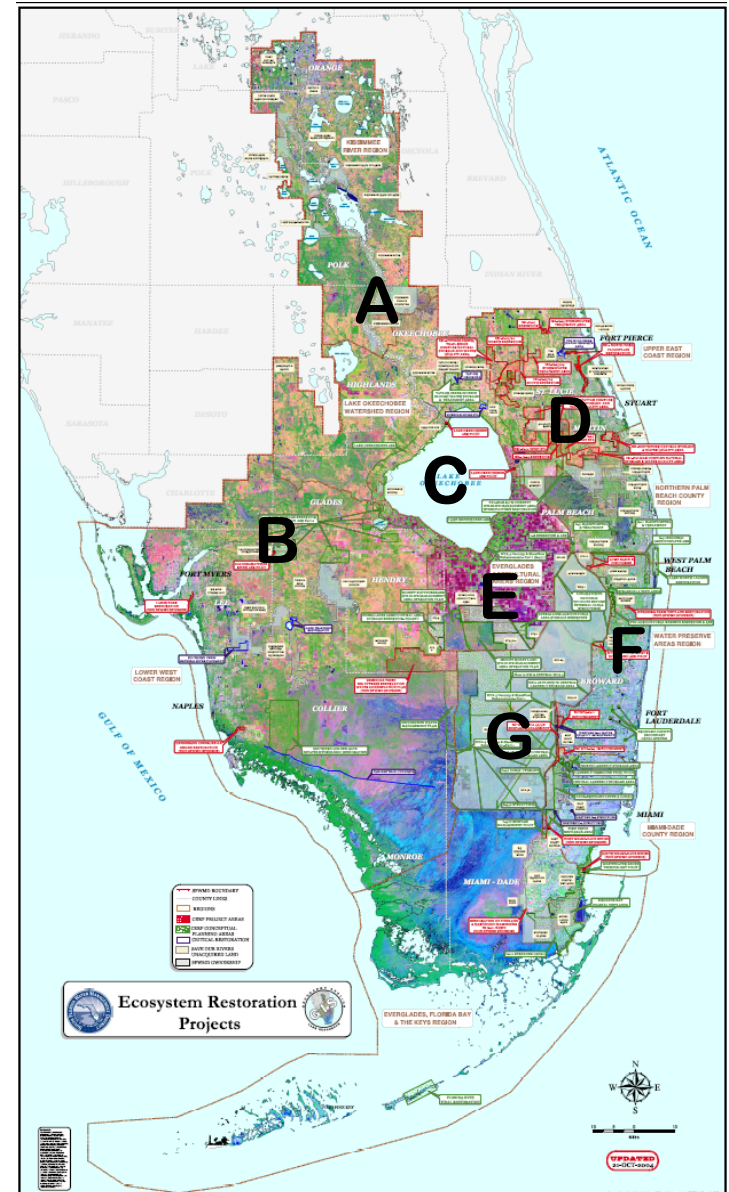
Landscape to be Restored

Problems Being Addressed

- Competing perspectives
- Competing restoration targets
- Competition for water
- Inadequate field data
- Process (stress/response) research

Problems being addressed, but with much difficulty.

Challenges

Ecosystem Restoration Projects

Decisions Required

- **Restoration v. preservation**
- **More v. less management**
- **Form v. function**
- **Processes v. targets**

- **Which targets are most reliable?**
- **Which targets are most attainable?**
- **Which targets receive priority?**
- **What is most efficient use of water?**
- **What is most effective use of water?**
- **Which field data are most critical?**
- **Which research is most critical?**

Challenges

Ecosystem Restoration Projects
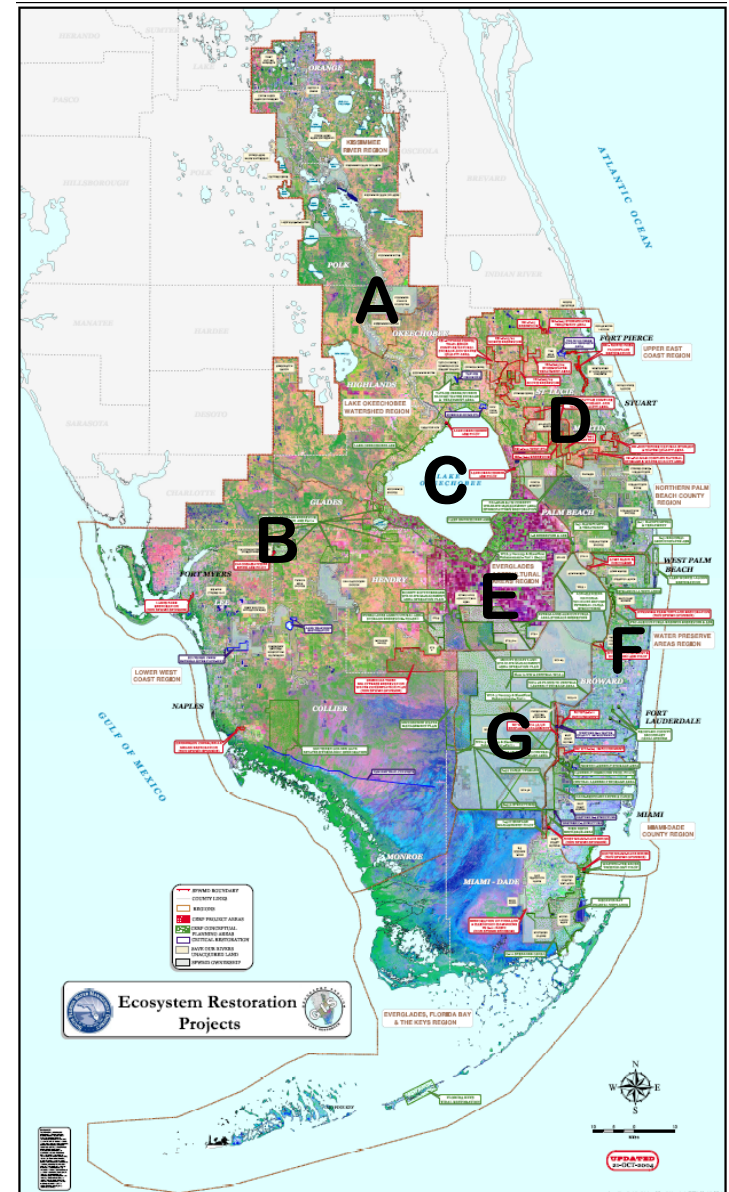
Tools Used/Needed

- Regional Hydrologic Models (used)
- Sub-Regional Hydrologic Models (used)
- Landscape Evolution Models (developed)
- Species models (developed)

- Enhanced Hydrologic Models (needed)
  - Better accuracy (flow and discharge)
  - Better accuracy (depth distribution)
  - System controls and management logic

- Water Quality Models – (needed)

- Vegetation succession models (needed)

- Soil/Sediment process/transport models (needed)

- Landscape Evolution Models (enhancement)

- Species / Community models (needed)

- Restoration optimization model (would help)

Ecosystem Restoration Projects
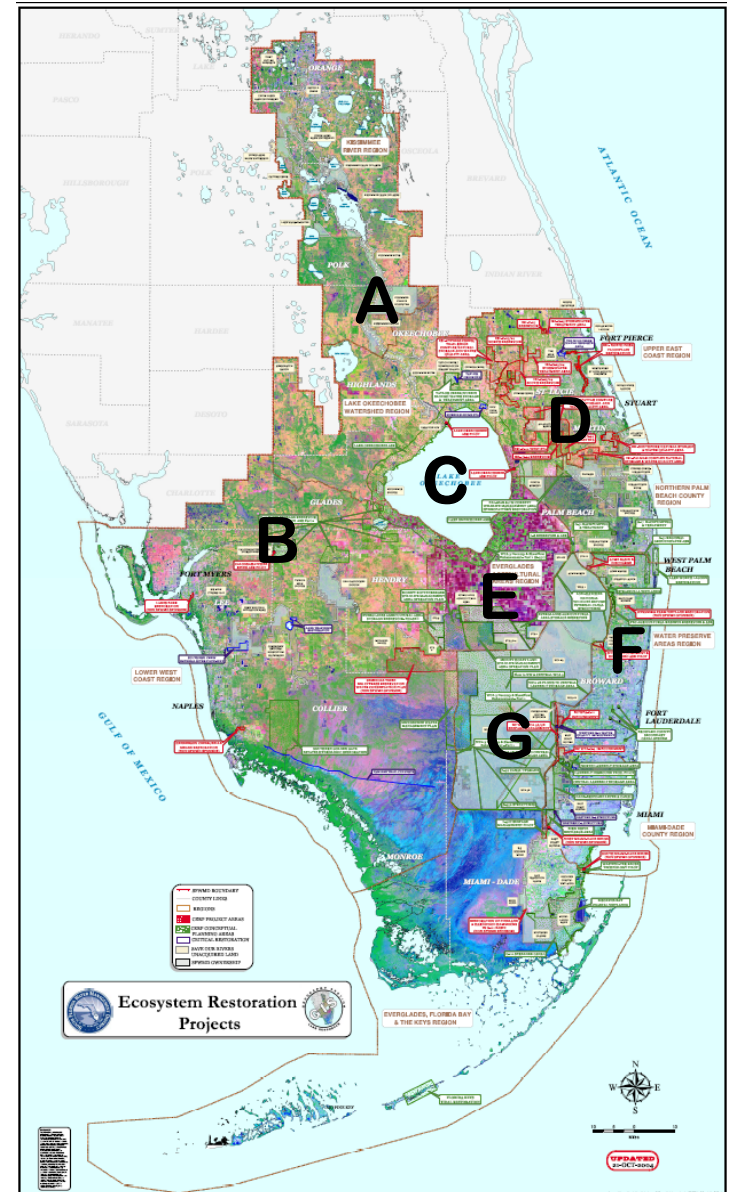
Summary

Ecosystem Modeling Challenges

- Complex, highly managed system
- General understanding of historic conditions exists
- General understanding of landscape, vegetation, and fish/wildlife dynamics exists
- Shortage of water quality models (many in development)
- Shortage of landscape models (many in development)
- One regional hydrologic model capable of simulating regional management

Decision Making Challenges

- Competition for water among and within watersheds
- Competing water management objectives among and within watersheds
- Occasionally conflicting restoration perspectives
- Occasionally conflicting restoration targets
- Prioritization of restoration goals (most efficient/sustainable use of resources)
- One regional hydrologic model capable of simulating regional management